EXHIBIT 16

Automotive Alphabet Google lawsuits Anthony Levandowski

A Waymo filing leaks lidar tech details in Uber lawsuit

Posted 3 hours ago by Kate Conger (@kateconger)

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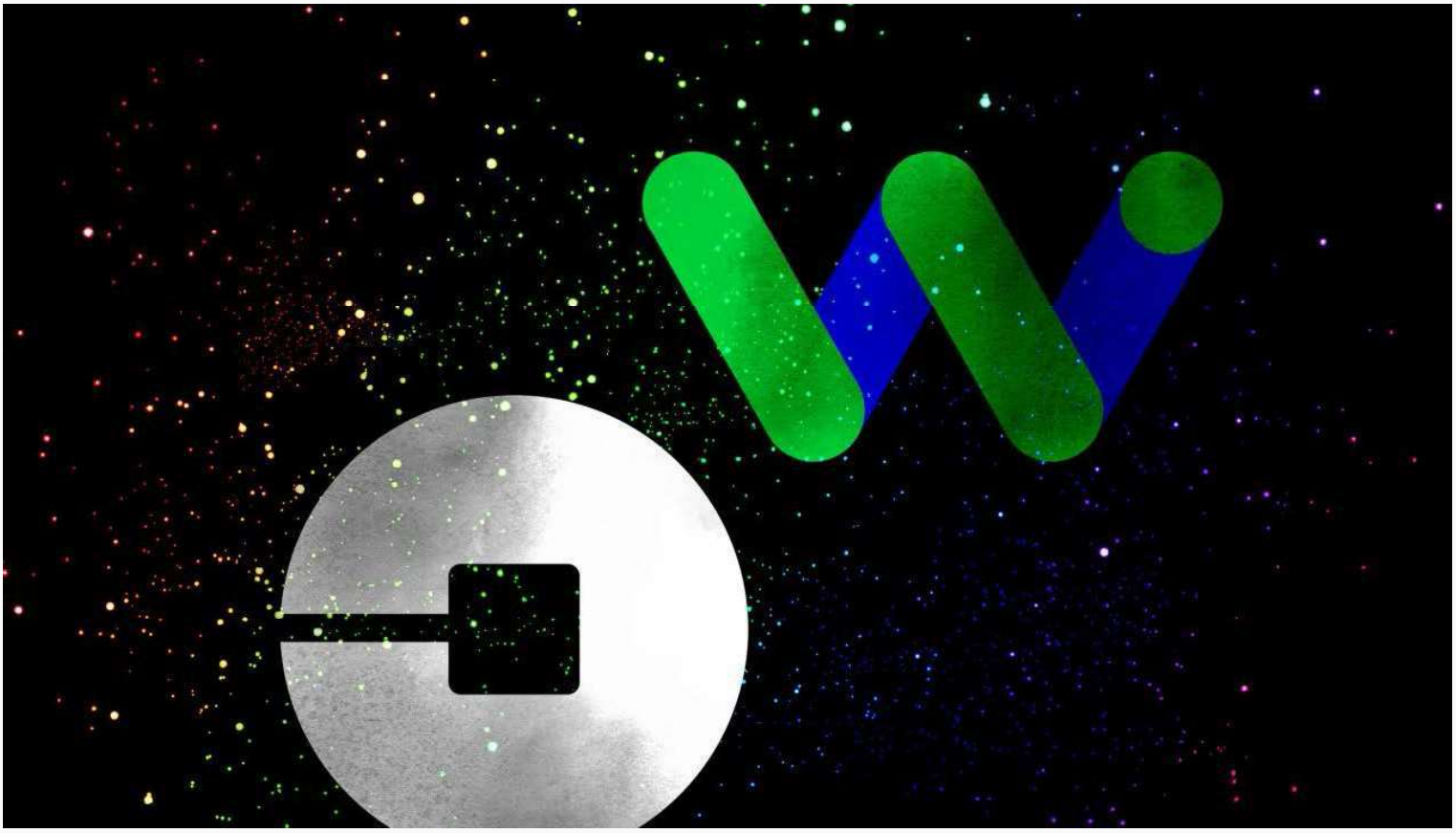

Anthony Levandowski took his seat in a conference room one sunny Friday morning in April and proceeded to read the same phrase from a sheet of paper for the next five hours.

“On the advice and direction of my counsel, I respectfully decline to answer. And I assert the rights guaranteed to me under the Fifth Amendment to the Constitution of the United States,” Levandowski said. And then he said it again. And again.

Levandowski, who describes himself as a pioneer in the field of self-driving vehicle technology, had never

been deposed before. But his contributions to the driverless car industry, first at Google's self-driving unit Waymo and later at Uber, have landed him at the center of a contentious legal battle between the two companies. During the April meeting with Waymo's lawyers, Levandowski was confronted with the details of the technology he created and asked to admit he had stolen it.

Although Levandowski answered no questions except a handful about his time as a UC Berkeley student, the questions themselves reveal certain intricacies of Waymo's technology — features that Waymo claims have inexplicably turned up in Uber's lidar devices.

The lawyers' questions for Levandowski also show that Waymo and Uber's arguments focus on different components of their respective lidar systems and that, as the preliminary injunction looms, the two companies are still talking past each other about their technology.

Waymo has accused Levandowski of copying tens of thousands of confidential files about its lidar technology and using them to jumpstart Uber's effort to become the first company to commercialize self-driving vehicles. On May 3, a federal judge will decide whether Waymo's allegations are convincing enough to temporarily halt Uber's work — a move that would devastate Uber's plan to become profitable.

"This is an exceptional case. It calls for exceptional relief," Waymo's attorney Charles Verhoeven wrote in a filing. "To this day, Levandowski remains heavily involved in Uber's LiDAR development. Uber should be enjoined from continuing to use Levandowski in its driverless car program and from continuing to misappropriate and infringe Waymo's intellectual property."

The case pits Uber's lidar device, codenamed Fuji and currently under development, against Waymo's device, the name of which is redacted in court documents and is already deployed on the road. Not only does the Fuji infringe on its trade secrets, Waymo claims, but Levandowski also developed another infringing device at Uber, codenamed Spider.

(Levandowski habitually named his inventions after mountains. At 510 Systems, his company that was later acquired by Google, a lidar system was named Little Bear, presumably after one of Colorado's more challenging 14ers. Later versions of Google's lidar were nicknamed Grizzly Bear 2 and Grizzly Bear 3. It's not clear if Uber's Spider and an early version of Tyto's lidar named Owl followed this convention, but mountains near the Canadian border of Washington bear the names of both creatures.)

Attorneys for Waymo say that Uber tried to keep Spider hidden from the court, while Uber argues that it didn't mention Spider because it never became fully fledged technology, amounting to little more than unassembled parts. Waymo learned of Spider's existence during the deposition of Asheem Linaval, an engineer Levandowski recruited from Google to join him at Uber, and was allowed to inspect the uncompleted device last week.

Although Waymo submitted an 80-page list detailing the roughly 100 stolen trade secrets to the court, its attorneys quizzed Levandowski on a handful of design details, including its use of fiber laser technology and its specific positioning of diodes on a printed circuit board.

TechCrunch learned the name of Uber's "Spider," Tyto's "Owl" and details about Waymo's technology from a transcript of Levandowski's mid-April deposition. Although the information is redacted in the transcript itself, the public filing included an index of all the words in the deposition and the page and line on which they appear. By cross-referencing the redactions with the index, it is possible to decipher most of the redacted information (Waymo has since yanked the public filing from the docket). The names of Spider and Owl were confirmed in an Uber filing late yesterday afternoon.

Secretive circuit boards

The printed circuit boards, or PCBs, are at the heart of Waymo's lidar systems. Lidar functions as the eyes of a self-driving car, sending out lasers that bounce off objects in the car's environment and ping back, creating a vivid map of the surroundings. The resulting images are beautiful "pin clouds" that depict nearby cars, obstacles and people.

These basics of lidar technology are publicly known, but information about Waymo's printed circuit boards, which make up the transmit and receive blocks that send out and collect the lasers, has not been made public.

During Levandowski's deposition, Waymo's attorneys questioned him extensively about the design of circuit boards used in lidar systems at both Waymo and Uber, giving less time to concerns about numbers of lenses and optical cavities. Many questions focused on the positioning and angle of diodes on the circuit boards, hinting that Waymo's infringement argument might focus on the minute details of the PCBs rather than on the number of lenses and optical cavities of Uber's lidar device — features Uber said make the Fuji unique.

Other questions in the deposition refer to the positioning and angle of diodes and guide pins on the printed circuit board, and the way some of the diodes are positioned at the edge of the boards.

"You used the confidential information you learned at Google to derive the diode spacing shown on the board?" a Waymo attorney asked Levandowski, showing him a diagram of Uber's circuit board. "Uber would not have been able to have developed the spacing on the Fuji board shown on Exhibit 25, without reference to the 14,000 files you downloaded in December 2015; correct?" (The word "spacing" was redacted in the transcript.)

The "confidential specifications" of every generation of circuit board Waymo has ever created are among

the 14,000 documents allegedly taken by Levandowski.

In December 2016, a supplier called Gorilla Circuits mistakenly copied Waymo on an email intended for Uber engineers that contained a drawing of a circuit board used in the Fuji. Although Google already knew Levandowski had downloaded confidential files, the email from Gorilla was the first indication he might be using the files at Uber, Google claims. Waymo says that similarities between its circuit board and Uber's are what triggered the litigation, and it identified "Gorilla" as one of 15 search terms for Uber to prioritize as it scans its servers for Waymo documents.

In a brief filed one week after Levandowski's deposition, Waymo argued that Levandowski's monotonous pleading of the Fifth Amendment could be used to infer that he had indeed stolen the trade secrets he was confronted with during the deposition. After all, if he hadn't stolen them, why wouldn't he speak up and correct the record?

Because Waymo's brief names the alleged trade secrets it confronted Levandowski with along with citations noting when each secret was presented to him, it is possible to piece together the names of the secrets with the underlying technology discussed in the deposition. Waymo describes the positioning guide pins on a printed circuit board as Trade Secret 14. (In a reply brief filed earlier this month, Uber huffily dismissed Waymo's claims about the secrecy of its guide pins, saying the concept is "as simple and as general as a Tinker Toy.") The number of printed circuit boards and the number of diodes on each board are categorized as Trade Secrets 2 and 3. Trade Secret 7 appears to reference the hanging of specific diodes. Trade Secrets 1 and 4 reference the spacing and angle of diodes.

Uber contends that Levandowski had no input in the spacing or angles of diodes on the PCB at Otto. In fact, Uber wrote in its filing yesterday that it initially considered Otto as a possible lidar vendor and provided its preferred diode spacing and angles to Otto in order to commission PCBs.

"Mr. Levandowski did not provide the beam spacing or angles for Spider, but instead asked Mr. Boehmke [an engineer hired by Uber from Carnegie Mellon], as the customer, to provide Uber's desired beam parameters, which were ultimately used as starting requirements for Spider," Uber's attorneys wrote.

After Uber announced its acquisition of Otto in August, the company claims Levandowski had no input into "the number of boards in the transmit block, configuration of the boards in the transmit block, number of laser diodes on each transmit PCB, number of optical cavities, number of channels, beam parameters, positioning of the laser diodes with respect to the edge of the PCB or on bond pads, the use of guide holes, the location and orientation of the laser diodes on the transmit PCBs, the manufacturing or alignment of FAC lenses, or methods of spacing."

Basically, Uber claims the similarities between its circuit boards and Waymo's have nothing to do with Levandowski,

saying they were developed by other engineers without his input.

Fiber saves money

Another feature that Waymo claims as part of its secret sauce is its use of fiber laser technology, which is referred to as Trade Secret 48. Waymo says that Levandowski downloaded a “specific presentation” describing the technology before abruptly quitting his job at Google.

In a deposition with Sameer Kshirsagar, another former Googler hired by Uber to work on its driverless cars, Waymo attorneys raised questions about Uber’s use of fiber laser technology. Levandowski insisted on particular levels of ion doping for optical fiber used in lasers, Kshirsagar said.

However, Uber has accused Waymo of over-claiming secrets, noting that some of the technologies it has claimed as secret in-house developments are actually common knowledge in the lidar industry — and the use of fiber laser technology in lidar is already well-known.

In a paper published last year by NASA’s Earth Science Technology Office, engineers noted that the adoption of fiber lasers in lidar had the potential to revolutionize the industry.

“An especially important consequence of laser technology development over the past decade is that fiber-laser average power capability now rivals that of traditional bulk solid-state systems, which is a distinct advantage,” the NASA team wrote. The new fiber systems are compact, an important advantage for driverless cars — older lidar systems are big, bulky and too expensive for the consumer market. Fiber systems also have the advantage of being “immune to misalignment.”

Cutting the size and cost of lidar systems is crucial for the development of self-driving cars. A lidar system from Velodyne, a leading manufacturer, can cost $75,000 — an unrealistic price tag for a consumer who’s already spending thousands of dollars on a car. That’s why Waymo has focused on reducing the size

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Uber must turn over to Waymo information about its acquisition of Otto,

and price of its lidar system, reportedly cutting costs by as much as 90 percent.

One shrinking measure that's been a focal point of the case so far is Waymo's reduction to a single lens for transmitting and receiving the laser beams. In contrast, Uber maintains that its Fuji is a multi-lens system. It's not yet clear whether Waymo's innovations on circuit boards and fiber laser technology helped it achieve its cost-cutting objectives — but it is clear that Waymo is willing to spend millions defending them.

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Injunction

In one week, U.S. District Judge William Alsup will decide whether or not to pump the brakes on Uber's self-driving program and Levandowski's career. Lawyers for Waymo have spent the past month trying to convince Alsup that Uber's technology is a ripoff of its own, while Uber's legal team argues that its technology is unique, developed without significant input from Levandowski or his trove of documents, and that its work should be allowed to continue.

So far, Uber seems to be losing the fight. During an April 5 hearing, Alsup noted that in 42 years he'd never seen a record as convincing as the one Waymo's presented.

Additional reporting by Darrell Etherington.

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